MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

ETM3056 – MULTIMEDIA AND COMMUNICATION NETWORKS

(TE)

12 OCTOBER 2015
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 5 pages with 4 Questions only.
2. Attempt **ALL** questions. Each question carries an equal total mark and the mark distribution for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1

(a) Two major types of media are captured and synthesized media.
   (i) Briefly explain the difference between captured and synthesized media.
   (ii) Give an example of a captured media and another example of synthesized media.
   (iii) Give an example of a synthesized and at the same time discrete media.

[2+2+2 Marks]

(b) Human voices typically have the highest frequency of 4kHz.
   (i) If the voices are later modulated using pulse code modulation with 8 bits per sample, what is the number of voice or speech signal of such frequency that can be supported in a trunk with a capacity of 320 kbps.
   (ii) If the voices are played for 50 minutes, what is the minimum size of the storage device that can be used to store the voices?
   (iii) What is the best method to store the voices in a device which has a storage size of ten times smaller than the memory of the storage device calculated in Question 1(b)(i) above?

[4+3+2 Marks]

(c) In data compression, the compressed message is typically generated in a number of codewords.
   (i) Give two important features of codewords generated by compression techniques.
   (ii) For a message with three distinct symbols or alphabets, the first alphabet which has the highest probability is coded as 01. List all possible codewords which can be used to code the other two symbols if the maximum allowable number of bits in the codewords is three.
   (iii) What is the minimum average number of bits per codeword when compressing a message with three distinct alphabets.

[4+4+2 Marks]

Continued...

Question 2

(a) Telephone networks such as Public Switched Telephone Networks (PSTN) may provide both analog and digital services to the users.

(i) Name and briefly describe two types of analog services supported by telephone networks.

(ii) Name and briefly describe two types of digital services supported by telephone networks.

(iii) If a user wishes to have a data service at a rate of 60 kbps, what type of services would you offer to this user? Justify your answer.

[4+4+3 Marks]

(b) Integrated Services Digital Network (ISDN) is designed to provide broadband services via circuit-switched networks.

(i) Briefly explain the general concepts and principles of ISDN.

(ii) Draw the general block diagram of ISDN.

[4+5 Marks]

(c) In B-ISDN, the physical layer has two sub-layers, namely the physical medium sub-layer and the transmission convergence sub-layer.

(i) Briefly describe two functions of the physical medium sub-layer

(ii) Briefly describe three functions of the transmission convergence sub-layer.

[2+3 Marks]

Continued...

Question 3

(a) There are two types of packet switching commonly applied in communication networks, which are virtual circuit packet switching and datagram.

(i) Briefly explain two features of each packet switching types aforementioned.

[8 Marks]

(b) The higher demands for higher speed data require the current communication networks to be upgraded in order to support these needs.

(i) If a company intended to have a data network of 10^8 bps within a geographical area having a diameter of 10^2 m, what is the best type of communication networks that should be developed?

(ii) Between Ethernet and Fast Ethernet, which of the two technologies which can fulfill the needs of the company in Question 3 (b) (i)? Explain briefly the feature of your chosen technology to justify your answer.

[2+2 Marks]

(c) One of the network devices used in the second layer of the seven layer Open Systems Interconnection (OSI) model is a layer 2 switch.

(i) Briefly explain the three differences between a layer 2 switch and a bridge.

(ii) List three drawbacks of a layer 2 switch.

(iii) Consider a pair of terminals, A and B, which are communicating between each other via a transmission path passing through a switch, S1, as seen in Figure Q3 (c). Assume that a 64-kilobyte message is to be transmitted from A to B. The network limits packets to a maximum size of 2 kilobytes, and each packet has a 32-byte header. The transmission lines in the network are error free and have a speed of 50 Mbps. Each hop is 1000 km long. How long does it take to get the message from the source to the destination?

[6+3+4 Marks]

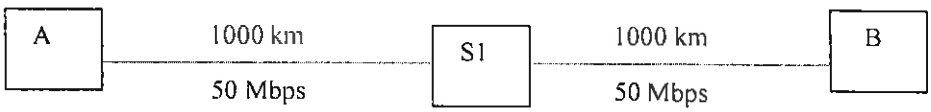

Figure Q3 (c)

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Question 4

(a) A Universal Mobile Telecommunications System (UMTS) is a third generation cellular telecommunication technology which employs Wideband Code Division Multiple Access (W-CDMA) radio access technology to offer a wider spectrum and larger capacity to the users.

(i) High Speed Downlink Packet Access (HSDPA) is a multi-code transmission system developed on WCDMA networks. Briefly explain the concepts of multi-code transmission and adaptive coding and modulation (AMC) applied in HSDPA.

(ii) If 15 multi-code channels are allocated to a single user, where each channel uses a 4-Quadrature Phase Shift Keying (QPSK) and a halfrate Turbo coding, what is the total number of bits per symbol allocated to the user?

(iii) What is the minimum theoretical total signal to noise ratio (SNR) required to realize the total number of bits per symbol calculated in the previous question.

[4+4+3 Marks]

(b) Long-term Evolution (LTE) is a new cellular telecommunication technology developed to significantly increase the achievable data rates in both downlinks and uplinks

(i) Briefly define and explain HSUPA and HSPA, which are two technologies developed before LTE.

(ii) List three features of LTE.

(iii) Explain the two multiple access techniques, Orthogonal Frequency Division Multiple Access (OFDMA) and the Single-Carrier Frequency Division Multiple Access (SC-FDMA), employed in the downlink and the uplink of a LTE system

[4+6+4 Marks]

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